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NOTES ON AMBLYSTEGIUM.

By A. J. GROUT.

The preparation of the treatment of *Amblystegium* for Part V. of my "*Mosses with Hand-Lens and Microscope*" has been a much dreaded task because of the difficulty of getting any adequate idea of the species from any published literature or from any accessible collections.

The task has proved as difficult as expected and I have seen all too numerous specimens that I cannot assign with certainty to any single species, though it is evident that each belongs to one or the other of two closely related and intergrading species.

Brotherus' treatment of the genus in "*Die Naturlichen Planzenfamilien*" I have found the most satisfactory of any, although following Loeske largely he fails to understand one or two of our American species, notably *Amblystegium orthocladon.*

I have found also that European authorities do not understand all the difficult and disputed forms, especially *hygrophilum,radicale*, *orthocladon*, and *Kochii*. Indeed the types must all be seen by one competent author to settle exactly what these species are. I have made my decisions by the best light I could obtain and I hereby return thanks to many of my European and American correspondents for the help they have so freely given in placing disputed plants. They have not always agreed but their very disagreements were helpful in explaining some of the worst puzzles.

This article is written with the idea that some of the facts discovered, and some of the opinions formed, will be helpful if expressed more at length than will be possible in the book.

It has long seemed evident that the minute ecostate species do not belong with the others. Brotherus and Loeske still retain them in the *Amblystegieae* but I believe they belong more properly in the *Hypneae.*

The remaining unicostate species can readily be divided into four groups, two of which are made genera by Brotherus.

The first subgenus, *Euamblystegium* Broth. is characterized by the short broad leaf cells, and costa slender for the genus, ending at the middle or somewhat above, percurrent in *compactum* and *Holzingeri* only. This includes *serpens* (L.) B. & S., *Juratzkanum* Schimp., *Kochii* B. & S., *compactum* (C. M.) Aust., and *Holzingerii* Grout sp. nov. Brotherus includes *varium* with *orthocladon* as a subspecies but to my mind *varium*, while intermediate between this group and the next is much more closely allied with *irriguum* than any other species, while *orthocladon* as I understand it is most pronouncedly of the latter type and closer to *irriguum* than to *varium*. He also places here *A. radicale* (P. B.) Mitt. but according to Cardot and Cheney this =*Hypnum Bergenense* Aust. which is the same as

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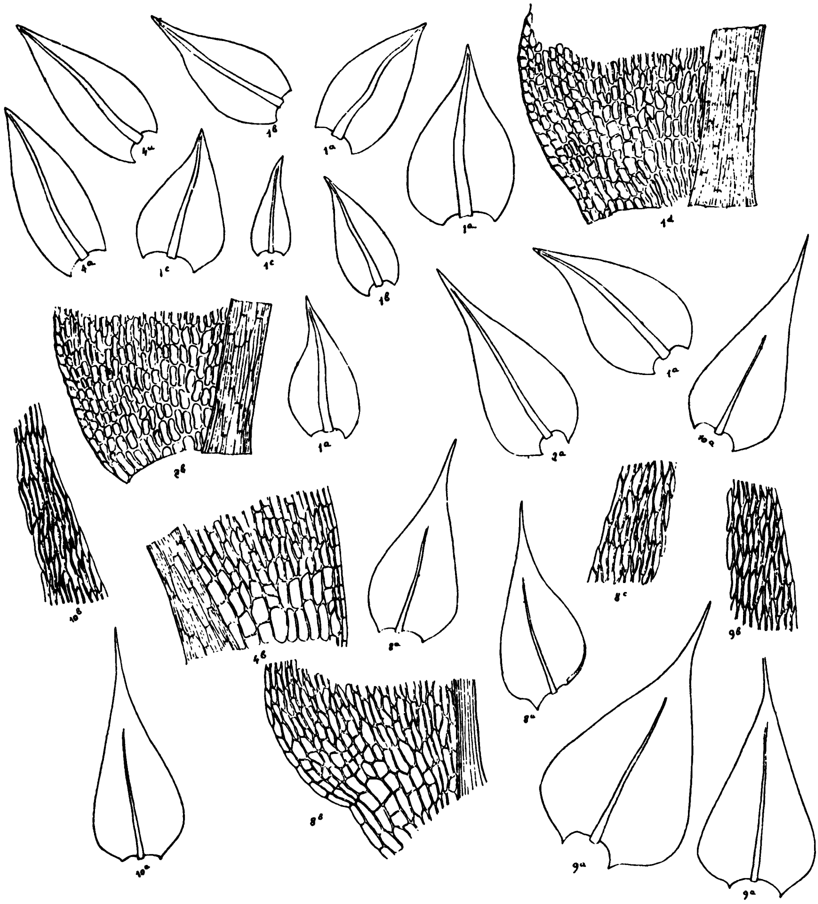

PLATE XI. Amblystegieae.

much of the material known in Europe as *A. hygrophilum* (Jur.) Schimp. *A. hygrophilum* of Limprich's Bry. Siles. No. 345 in Herb. Columbia Univ. =*Hypnum Bergenense* without a doubt, but Husnot's Musc. Gall. No. 939 in my collection, issued as *A. hygrophilum* is not *H. Bergenense* at all but what several American and European authors have termed *A. Kochii.* This species is not at all the *Hypnum radicale* of the L. & J. Manual, that is a form of *varium.* In my opinion *Hypnum Bergenense* is a *Campylium*, as it was in the opinion of Austin, and Limpricht's No. 345 was issued as a *Campylium.* Austin's specimens are labelled as a var. of *C. chrysophyllum* and the stem leaves are much like those of that species, broadly cordate-ovate and abruptly and longly acuminate, decurrent and subclasping at base so that the leaf *will not lie flat at base*, when removed and mounted. The alar cells are *thin-walled*, *hyaline* and conspicuously broader than those above. The leaves are also entire, costate to middle with median leaf cells 6–10:1, thin-walled and less chlorophyllose as a rule than in most *Amblystegia.* It differs from *Campylium chrysophyllum* in the much more distant leaves, little branched stems more lax general habit and resemblance to the *Amblystegia* in appearance. *A. Kochii* while associated with *A. riparium* by Brotherus is apparently often confused with *Campylinm radicale.* Its leaves spread directly from the flat base and are flat throughout with shorter leaf cells having thicker walls.

A. serpens a comparatively well known and understood species grades into *A. Juratzkanum*, which appears to me at most merely a robust variety of *serpens* with larger, more spreading leaves having a less distinctly marked area of quadrate alar cells. The alar cells are more likely to be all longer than broad than in *serpens*, but this distinction does not always hold and I am inclined to think it a matter of habitat for I have found leaves with the alar cells of *A. serpens* on one side and *A. Juratzkanum* on the other.

There is a western moss with the size of *A. Juratzkanum* and alar cells of *A. serpens*, having the leaves proportionately broader and more shortly acuminate than in *serpens.* This I have not found described. It appears to be common in the Rocky Mountains, and until further light is shed on the problem I propose the name *A. serpens* var. **giganteum** var. nov. for it. Were it not for its peculiarly distinct quadrate alar cells it might be put with forms of *Kochii* into which *Juratzkanum* seems to me to grade. *Kochii* being distinguished by its larger size, laxer basal areolation and larger cells. Cheney speaks of *A. Kochii* as not common, but the form I have referred to *A. Kochii* is abundant in the East. *Amblystegium Kochii* is distinguished from small forms of *A. riparium* by its usually spreading leaves, more slenderly acuminate and sometimes serrulate and its wide short leaf cells, 3–6: 1. Small poorly developed forms of *A. varium* having the costa end below apex are sometimes confused with a *A. Kochii*, but the costa is much thicker and the leaf cells as a rule shorter and broader. *Amblystegium Kochii*, as I find it, has the leaves ovate-lanceolate and narrower than figured in the Bry. Eur. where it was originally described, also less contracted at base, but my material agrees well with authentic European material and has been identified as *Kochii* by European experts. Sometimes forms which I would refer to *Kochii* are found in collections labeled *hygrophilum*, mistakenly so I think, but the types of both need to be seen to make certain.

A. compactum is about the size of *serpens*, light green, yellowish within the dense tufts which may be 25 mm. deep but are usually thinner. Leaves erect open, about 1 mm. long, narrowly decurrent, lanceolate to ovate lanceolate, gradually long acuminate, finely denticulate throughout, teeth at base frequently recurved; "teeth formed of a single or a double papilla over the transverse wall or by the protrusion of the adjoining corners of the marginal cells." Costa percurrent or nearly so, broad but thin and sometimes almost discontinuous, frequently bearing delicate brood filaments from the back or apex; branch leaves narrower and smaller. Seta short; capsule small, erect or slightly inclined, nearly or quite symmetric. Mr. Dixon thinks *A. dissitifolium* Lindb., *A. subcompactum* Kind. and *Brachythecium densum* Milde are synonyms of this species.

Amblystegium Holzingeri sp. nov. Plants growing in rather thick wide mats, light olive green, closely allied to *Amblystegium compactum* but about twice as large, lighter colored and lacking the dense cespitose habit typical of that species; stems 2–3 cm. long, irregularly to supinnately branching, bearing numerous multiform paraphyllia; stem leaves spreading to subsquarrose when dry; ovate-lanceolate and gradually long-acuminate, about 1×0.3–0.4 mm., somewhat narrowed to the insertion, strongly and longly decurrent, concave, with basal margins more or less reflexed, serrulate all around, costa percurrent or vanishing in the apex, stronger than in *Amblystegium compactum*; median leaf cells linear-vermicular, becoming shorter and broader toward the base, cells of basal angles subrectangular to quadrate; branch leaves smaller; minutely scabrous protonema frequent on costa of stem leaves, slender brood filiments not rare. Collected at Trempealean Ridge, Wisconsin, June 20, 1904, by Prof. J. M. Holzinger. Type in Herb. A. J. G.; cotypes will be distributed as No. 335 of North American Musci Pleurocarpi.

The type locality is about ten miles south of Winona, on the Mississippi River. Prof. Holzinger says this locality has produced many rare things.

This species is closely related to *Amblystegium compactum* and often has the peculiar teeth at base of leaves characteristic of that species, but its larger size, lighter color, and numerous paraphyllia, combined with several minor characters, sufficiently distinguish it.

The type collection is sterile and might easily be referred to *Brachythecium*. The brood bodies are not like any figured by Correns but I have seen similar ones on *Amblystegium compactum*.

The second subgenus, *Hygroamblystegium* Loesk. (Published as a genus,) contains *A. varium* (Hedw.) Lindb., *A. fluviatile* (Sw.) B. & S., *A. irriguum* (Wils.) B. & S., *A. orthocladon* (P. B.) Kindb., *A. noterophilum* (Sulliv.) Warnst. and *A. filicinum* (L.) De Not. (Treated on p. 315 of Mosses with Hand-Lens and Microscope as a *Cratoneuron*.) With the exception of *varium* and *filicinum* this subgenus is aquatic when growing normally, *Amblystegium filicinum* not infrequently grows in water, *A. varium* typically grows in wet places. The plants when aquatic are usually dark to blackish green and have a very stout percurrent costa and in some species paraphyllia are present. When aquatic the members of this subgenus are found on stones in brooks and springs. The leaf cells are typically very broad and short, 2–4: 1, much longer in large forms of *A. fluviatile* and *A. irriguum* approaching respectively *A. noterophilum* and *A. irriguum* var. *spinifolium*, and in those forms themselves.

It is in this group that the greatest difficulties are met as the species vary greatly and undoubtedly intergrade. *A. fluviatile* forma *typica* Boulay is exactly illustrated by the plate (567) of the Bryologia Europea, except possibly that the costa usually appears stronger at the apex. The leaves are oblong to ovate-oblong, gradually narrowed to a rather blunt point; costa exceedingly stout and percurrent, nearly as wide at apex as at base; the upper leaf cells are elongated (for the group) and thick walled, in the lower 1/5 of the leaf broader and subrectangular. *A. fluviatile* forma *brevifolia* Boulay, which is more like the form figured by Cardot as the type (See fig. 4) has shorter leaves, oblong-ovate to ovate, with fewer lax cells at base and these often brown, with very thick walls, becoming opaque with age.

Through forma *brevifiolia*, *fluviatile* grades into what I, in common with several authors both European and American, think to be the true *orthocladon* of Palisot (not of many other authors). In this the leaves are cordate-ovate, shortly and rather bluntly acuminate, with very short thick walled cells (2–3: 1) with a few larger thick walled brown and opaque cells at the base in fully developed leaves. This I find to be not uncommon in the brooks of the East. *A. irriguum* (Wils.) B. & S. has forms which come very close to *orthocladon* but in general most of our forms have ovate-lanceolate, longly acuminate leaves with costa more tapering to the narrower apex. *Amblystegium irriguum* also has larger laxer floating forms which are to the commoner form what forma *typica* is to forma *brevifolia* in *A. fluviatile*. Such in particular are plants collected by M. Dupret "On stones in bed of a spring" Seminary of Philosophy" Montreal.

This form of *Amblystegium irriguum* approaches the var. *spinifolium* and has the large elongated cells and laxer basal areolation of that variety. In the Montreal plants, at least, paraphyllia were so numerous that at first I thought it a form of *A. filicinum*, and indeed these two species also seem to intergrade so that the inflorescense alone will decide the relationship of some forms; if indeed this is ever decisive in the *Hypnaceae*.

A. irriguum also appears to grade into *varium*, which typically is a less aquatic plant with more short cells at the marginal base of the leaf; leaves more ovate at base, more contacted to the insertion and more abruptly acuminate with a much more slender costa. The harshness and rigidity attributed to *irriguum* I have been unable to verify as a specific character, for most species of the group are harsh and more or less gritty. *A. irriguum* var. *flacidum* De Not. is an attenuate floating form with very distant and small leaves.

A. varium forma **ovata** f. n v. has smaller stem leaves which are more concave, round-ovate, abruptly and narrowly short-acuminate with nearly the outline of the leaves of *Thelia asprella*; quadrate alar cells very numerous, extending up 1/3 the margin of the leaf. Type in my herbarium from near St. Louis, Mo., growing with *Eurhynchium hians* and *Mnium cuspidatum*. In a way this parallels *A. orthocladon* but differs from it in its more slender costa, more slender acumen and lack of highly colored opaque basal cells, as well as in habitat.

A. noterophilum is to *fluviatile* what var. *spinifolium* is to *irriguum*, a very large form with larger, more elongated leaf cells and strongly excurrent costa. In Europe a corresponding form of *filicinum*, *A. fallax* (Brid.) Milde, or perhaps better known as *filicinum* var. *Vallis clausae*, is found, and it is not unlikely that it may occur here also.

The third subgenus *Leptodictyum* Schimp. has been raised to the rank of a genus by Warnstorf. The species are apparently mostly derivatives of *A. riparium* (L.) B. & S., and besides this species includes *A. vacillans* Sulliv., *A. Floridanum* R. & C. and three recently described species of Cardot and Theriot, *A. brachyphyllum* and *A. brevipes* from Minnesota, *laxirete* from Missiouri. As the three species are admittedly closely related to the polymorphous *A. riparium*, it is probable that most authors would regard them merely as varieties. *A. vacillans* is a rare plant with long slender stem leaves having a subobtuse apex and short apical cells. I do not believe the large specimens from Georgia and Florida that have been referred here (N. Am. Musci Pleurocarpi 269) really belong with the northern plant.

For the convenience of students I will cite corrections of my N. Am. Musc. Pl.

No. 48 issued as *Hypnum chrysophyllum* is my idea of a common form of *A. Kochii* and has so been determined by several eminent authorities. No. 243 contains the same with some *A. varium*. No. 180 issued as *A. fluviatile* I believe to be *A. orthocladon*. No. 149 issued as *irriguum* is probably the same. Cheney called it *irriguum* but Renaud (Fide Dupret) thought a similar form belonged rather to *fluviatile*.

No. 177 and No. 266 as *A. varium* appear to me to be aquatic forms of *filicinum* nearer to *irriguum* than *varium*.

No. 291 issued as *varium orthocladon* and No. 247 issued as *irriguum* are the large form of *irriguum* approaching var. *spinifolium* and certain forms of *filicinum*. No. 130 issued as *A. compactum* is in my opinion a cespitose form of *serpens*. This had been examined and named by people who ought to know and it may be mixed. My set is certainly not *compactum*.

The fourth group includes *A. Lescurii* (Sulliv.) only of our species. This is characterized by its strongly bordered leaves, but for this it would sometimes be difficult to distinguish it from *A. orthocladon*. It rightfully belongs to another genus and should be called *Sciarmonium Lescurii* (Sulliv.) Broth.

EXPLANATION OF PLATE XI.

FIG. 1. *Hypnum orthocladon* P. B. a, Four leaves × 30, from a specimen in the herbarium of Schwaegrichen from North America and communicated by Palisot. b, Two leaves × 30 from a specimen in the herbarium of Schwaegrichen; collected by Muhlenberg in North America. c, Two leaves × 30 from a specimen in the herbarium of Schwaegrichen; collected in Cuba by Pöppig. d, Lower portion of a leaf × 135.

FIG. 2. *Leskea varia* Hedw. from Pennsylvania (Muhlenberg). a, A leaf × 30. b, Lower part of the same × 135. (From an "original" specimen.)

FIG. 4. *Hypnum fluviatile* Sw. a, Two leaves × 30. b, Lower portion of one of these leaves × 135. (From an "original" specimen communicated to Hedwig by Schwartz and preserved in the herbarium of the former.)

FIG. 8. *Hypnum radicale* P. B. from North America (Palisot and Richard). a. Three leaves × 30. b, Lower portion of one of these leaves × 135. c, Cells from the middle portion of the same × 135. (From specimens in the herbarium of Schwaegrichen.)

FIG. 9. *Hypnum Bergenense* Austin, from Closter, New Jersey. (Austin "original" specimen.) a, Two leaves × 30. b, Middle portion of one of these leaves × 135.

FIG. 10. *Amblystegium hygrophillum* Sch. from Germany. a, Two leaves × 30. b, Middle portion of one of these leaves × 135.

These figures and their descriptions are taken from M. Cardot's valuable "Revision of the Types of Hedwig and Schwaegrichen" published in the "*Bulletin de l'herbier Boissier*," in 1899. The specimens marked as "original" were evidently communicated or furnished by the authors and though not types in every case certainly should be regarded as authentic. It should be remembered, however, that in those early days of inferior microscopes material was often mixed and the authors of species themselves had mixtures in their types. M. Cardot's figures have been presented as being as near authenticity as anything available. The figure *H. Bergenense* fails to show the characteristic concavity of the base as shown in Austin's Musci Appalachiani No. 391.

Cheney has studied Palisot's types, and has come to somewhat different conclusions concerning several matters as noted under different species, but I personally sent specimens which I consider typical *A. orthocladon* to Cheney and he called them *A. irriguum* in most cases, although he states positively that Palisot's type is *A. fluviatile.* I hazard a guess that the specimen Cheney commented on is a form of *A. orthocladon* approaching forma *brevifolia* of *fluviatile.*

New Dorp, New York.